USING PARASITES AS BIOLOGICAL TAGS FOR STOCK DISCRIMINATION OF THE ATLANTIC MACKEREL *SCOMBER SCOMBRUS* OFF THE COAST OF TUNISIA

Mariam Feki [1]* and Lassad Neifar [1]
[1] Faculté de Science de Sfax, Tunisie - feki_marial@yahoo.fr

Abstract

Five helminth parasites were used as biological tags to discriminate the stock structure of *Scomber scombrus* from four fishing localities off the coast of Tunisia (Bizerte in the north, Kelibia and Mahdia in the center and Zarzis in the south). Discriminant and nonparametric analysis, used for the separation of this species, allowed for the identification of three stocks: one in the north, one in the center and one in the south. 57% of specimens from four localities were classified correctly in their origin regions. All selected parasites would be good biological tags to discriminate stocks. The discrimination among individuals in different areas could be a consequence of the different environmental factors and to changes in the prey availability of the intermediate hosts to the host fish.

Keywords: Fishes, Parasitism, Stock assessment, Tunisian Plateau

The Atlantic mackerel *Scomber scombrus* is one of the most abundant pelagic fish with great commercial and economic importance in Tunisia, with reported landings of about 4.725 tons in 2011 [1]. This species is widely distributed in Tunisian waters but with a geographical distribution varying between localities [2]. Discriminating between distinct populations of the same species of commercially exploited fish is essential to determine their dynamics and manage their long-term sustainability. In the present study, parasites were used as biological tags for stock discrimination. A total of 369 specimens of *S. scombrus* from 12 distinct fish samples were collected between at four fishing localities off the coast of Tunisia, Bizerte in the north, Kelibia and Mahdia in the center and Zarzis in the south.
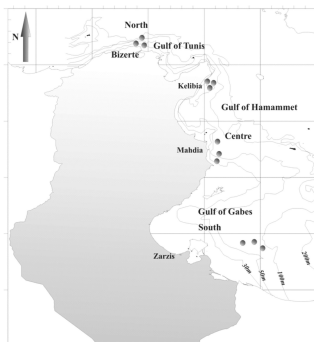

Fig. 1. Map of the Tunisian coast showing the locations used to sample *Scomber scombrus*.

Each fish was examined to find all macroparasites. For each parasite species, prevalence and mean abundance were calculated [3]. Geographical variations of these parameters were tested by statistical tests X² and ANOVA. A discriminant analysis was performed to separate mackerels from different regions. Three ectoparasites; one copepod *Caligus* sp. and two monogeneans *Grubea cochlear* and *Kuhnia scombri* were recorded from gills. Four endoparasites; three digeneans, *Prodistomum orientalis*, *Opechona bacillaris* and *Lecithocladium excisum* and nematod anisakidae larvae were collected from digestive tract. All parasites with a prevalence >5% will be involved in the discrimination analyses except *Caligus* sp. with prevalence $1.11 < 5\%$. Monogeneans *G. cochlear* and *K. scombri* and the digenean *P. orientalis*, were not found in specimens from Bizerte. Anisakidae larvae were not recorded in fish from Zarzis. Comparisons of the prevalence and mean abundance of all parasites showed significant differences between Bizerte and other localities ($P < 0.05$). Between Kelibia and Mahdia, infection parameters of all parasites do not show any significant differences ($P > 0.05$). The prevalence and mean abundance of some parasites vary between Zarzis and Mahdia and Kelibia ($P < 0.05$). The discriminant analysis separate *S. scombrus* from 4 regions in three stocks (Wilks' lambda = 9.34; $P < 0.01$): one in the north from Bizerte, one in the center regrouped specimens from Kélibia and Mahdia and one in the south from Zarzis.
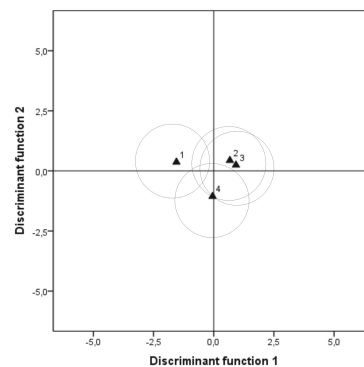

Fig. 2. Sample scores of the first two discriminant functions for specimens of *Scomber scombrus* in four zones of the Tunisian coast 1, Bizerte; 2, Kelibia; 3, Mahdia; 4, Zarzis.

All selected parasites species were good biological tags for stock discrimination. The discrimination among specimens in different areas could be a consequence of the different environmental conditions and to changes in the prey availability of the intermediate hosts to the host fish.

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